

Los Alamos National Laboratory
Environmental Restoration Program
Standard Operating Procedure

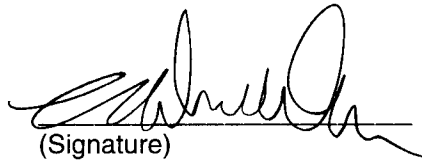
No: LANL-ER-SOP-12.04

Rev: 1

PHYSICAL PROCESSING AND STORAGE OF
BOREHOLE SAMPLES AT THE SAMPLE MANAGEMENT FACILITY

Prepared by

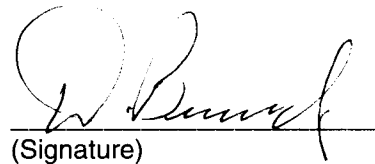
Dow Davidson
(Print Name)


(Signature)

15 DEC 1994
(Date)

Quality Review by

Dave Bradbury
(Print Name)


(Signature)

1/18/95
(Date)

Technical
Review by

Greg Bayhurst
(Print Name)


(Signature)

12-20-94
(Date)

PM Approval

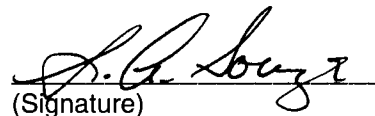
Jorg Jansen
(Print Name)


(Signature)

3-3-95
(Date)

QPPL Approval

Larry Souza
(Print Name)


(Signature)

3/3/95
(Date)

Effective Date:

3/10/95

**PHYSICAL PROCESSING AND STORAGE OF
BOREHOLE SAMPLES AT THE SAMPLE MANAGEMENT FACILITY**

Contents

1.0 PURPOSE	2
2.0 SCOPE.....	2
2.1 Applicability	2
2.2 Training.....	2
3.0 DEFINITIONS.....	2
4.0 BACKGROUND AND CAUTIONS.....	3
5.0 EQUIPMENT	4
6.0 PROCEDURE.....	4
6.1 Core Processing Documentation.....	4
6.2 Container Preparation and Core Marking.....	5
6.3 Core Slabbing and Bagging of Rubble.....	6
6.4 Final Slabbed Core Marking.....	6
6.5 Core Photography.....	6
6.6 Bagging of Core	7
6.7 Cuttings Processing.....	7
6.8 Sample Storage.....	8
6.9 Radiologically Contaminated Sample Handling and Storage.....	8
7.0 REFERENCES.....	9
8.0 RECORDS	10
9.0 ATTACHMENTS.....	10

PHYSICAL PROCESSING AND STORAGE OF BOREHOLE SAMPLES AT THE SAMPLE MANAGEMENT FACILITY

1.0 PURPOSE

The purpose of this procedure is to facilitate the physical processing and storage of borehole samples at the Environmental Restoration (ER) Project Sample Management Facility (SMF).

2.0 SCOPE

2.1 Applicability

This procedure applies to all SMF staff performing physical processing and storage of samples collected from ER Project boreholes.

2.2 Training

SMF staff and any other ER Project personnel performing activities within the scope of this standard operating procedure (SOP) must be trained to this procedure before conducting work, and must certify they have read and understood this procedure and the SOPs comprising general instructions (Section 1.0 of the LANL-ER-SOPs).

3.0 DEFINITIONS

- A. **Analytical Sample:** An analytical sample is a subsection or portion which has been removed from a sample that undergoes testing, analysis, or other technical or scientific evaluation. It is also referred to as a specimen.
- B. **Archival-Research Borehole Sample Processing System:** The archival-research borehole sample processing system of sample curation is based upon splitting a representative sample of core or cuttings from the total collected sample, one of which is preserved as an archive (archival split), the other of which is available for research and analysis (research split).
- C. **Core:** A core is a cylindrical section of rock, or fragment thereof, that is taken as a sample of the interval penetrated by a core bit and that is brought to the surface for examination and/or analysis.
- D. **Curatorial Sample Inventory and Tracking System:** The Curatorial Sample Inventory and Tracking System (MacCSITS) is the Macintosh based computer data base that has been developed to track in detail all actions taken on ER Project samples over which the SMF has control. The primary objective of MacCSITS is to assist in establishing and maintaining traceable records of each sample collected for the ER Project. The MacCSITS user's manuals and other related documents will be available to users.
- E. **Cuttings:** Cuttings are chips of rock produced during drilling that are removed from the borehole by circulation of drilling fluids (gas, foam, or liquid).

- F. Existence Code: A designator that describes the existence condition of a borehole sample.
- G. CPM: Counts per minute.
- H. Information Block: An information block is an object placed in a sample container. The block represents a depth interval and provides information pertaining to the status of that interval.
- I. Rubble: Rubble consists of fragments of core from a single interval, the individual diameters of which average less than one half the diameter of the whole core.
- J. Sample Management Facility: The SMF is the facility used for the documentation, storage, and control of borehole samples and specimens collected and distributed for analysis and evaluation by ER Project personnel. The SMF consists of physical facilities and equipment designed to effectively process and preserve collected borehole samples.
- K. Sample Type: Sample type designates the type of material that makes up a sample, i.e., core or cuttings.
- L. Sample: A sample is a physical entity, representative of the whole, that is collected or generated for data, analysis, or testing.
- M. Specimen: A specimen is a subsection or portion that has been removed from a sample or remnant that undergoes testing, analysis, or other technical or scientific evaluation and is tracked individually. It may also be referred to as an analytical sample.
- N. Unique Identifier: A unique identifier (ID) is a designation that sets a documentable object or event apart from similar entities. It may be an assigned number, a name and alphanumeric designation, or a set of data items that collectively serve to specify an entity. Examples of unique identifiers used in this procedure include Borehole ID, Container ID, Sample ID, or Specimen ID.
- O. Whole Core Specimen: A whole core specimen is a subsection of whole core that constitutes the entire core sample recovered for the depth interval represented.

4.0 BACKGROUND AND CAUTIONS

- A. The implementation of LANL-ER-SOP-12.02 will ensure that a determination is made as to the levels of radioactive and non-radioactive hazards associated with samples accepted by the SMF. This determination must be made prior to the use of this sample processing procedure. The user of this procedure is responsible for verifying that contamination levels in relation to the SMF Acceptance Criteria have been made for each sample prior to physical processing.

If sample contamination levels are **at** natural background but below the upper limits of the SMF Acceptance Criteria the following handling precautions must be taken:

1. Laboratory coats and plastic or rubber gloves must be worn while manipulating exposed sample material.
2. Eating or drinking must be prohibited in areas where these samples are open to the environment.

If sample radioactive contamination levels are **above** background levels, handling precautions described in Section 6.9, Handling Radioactive Samples must be followed.

5.0 EQUIPMENT

Equipment necessary for this procedure may include, but is not limited to:

Core boxes and dividers
Core marking supplies
Measuring rulers marked in tenths of a foot
Pneumatic staple guns
Polyethylene lay-flat tubing
Polystyrene core cradles
Work tables equipped with casters

6.0 PROCEDURE

Introduction

Borehole samples received from ER Project field sites shall be processed after arrival at the SMF and completion of confirmation and verification (LANL-ER-SOP-12.02). The purposes of processing these samples are: (1) to ensure proper identification and maintain traceability on these samples, and (2) to photo-document core. In addition to the purposes for processing, core greater than 3" diameter and cuttings optionally will be divided: (1) to prepare an archival split for future reference, and (2) to prepare a research split for data-gathering activities. Samples will undergo different phases of processing, depending upon the condition of the sample and the analytical data to be derived. At the discretion of the Curator, core greater than 3" diameter may be left whole for analytical purposes or because it is too unconsolidated for slabbing. An archival split may be cut from whole core or separated from cuttings (if cuttings have been collected and submitted to the SMF). The research split of core shall be photographed and placed in the appropriate storage location. At the discretion of the Curator, the archival split may be photographed in addition to or instead of the research split.

6.1 Core Processing Documentation

6.1.1 Information from MacCSITS will be used to generate one Core Processing Checklist (Attachment A) per box to document the various steps in the processing of whole core. The Core Processing Checklist must have as a minimum; the container ID, the borehole ID, container depth interval, a list containing the depth interval and existence code of each sample within the container, and a list of specific steps for processing the core, with a space for checking the completion of each.

6.2.2 Additionally the Checklist will have a space for including any special processing instructions that may apply to a specific container. The Checklist will have spaces for recording the permanent storage location assignment for the container and signature and date spaces to document the completion of core processing. During processing, the Core Processing Checklist will be stored in a document cache mounted inside the lid of each box. Core that measures less than 3" diameter will not be slabbed. Individual steps in the Core Processing Checklist that do not apply to small bore core or core that is not being slabbed must be marked "N/A" during core processing. The Core Processing Checklist must be verified and signed off in the space provided by Curatorial Staff upon the completion of the form.

6.2 Container Preparation and Core Marking

6.2.1 Core that is not to be slabbed remains in the same box in which it was received from the field (unless the container has been damaged). Information from MacCSITS is used to generate five labels for each box, including container ID, borehole ID, depth interval, sequential container number and type of sample, i.e., core. Labels are affixed to both ends of the container base and lid, and on one side of the container lid.

6.2.2 The whole core is removed from the field core box and placed one row at a time in core trays fastened to a work table. The interior of each box is marked at the top and bottom of each row to indicate the total depth interval represented in that row (i.e., core, unrecovered core, whole core specimens removed, etc.). For slabbed core both the archival and research core box interiors are marked.

6.2.3 Core that is to be slabbed requires another box of the same size to be constructed with polystyrene cradles. Polystyrene core existence and whole core specimen blocks are placed in the research split box at the appropriate positions, and duplicates made and placed in the archival split box.

6.2.4 Labels for these blocks are generated using information in MacCSITS just as with non-slabbed core. After the core from a field box has been slabbed, the field box will hold the research split of core and the newly constructed box will hold the archival split of core. After all the core (excluding whole core specimens) from a borehole has been slabbed and boxed, a sequential box number will be marked on the box (i.e., Box 3 of 45).

6.2.5 For core not being slabbed ensure that the field markings are complete, clear and unobscured; redraw them as necessary using the process described in ER-SOP-12.01. On core that is to be slabbed, a second set of permanent orientation stripes must be placed 180° from the existing orientation stripes on the core. The blue footage indicator is extended with a permanent marker to completely circumscribe the core. Depth indicators are permanently marked in blue and appropriately located on both sides of the core (Attachment B).

6.3 Core Slabbing and Bagging of Rubble

6.3.1 For core that is to be slabbed, approximately 3 ft of whole core (3" diameter or larger) from the work table is placed in the core sawing jig with the top end to the operator's left and the original field orientation stripes facing outward toward the saw operator. The core shall be slabbed longitudinally into the approximately 1/3 archival split and 2/3 research split, each portion containing identical markings. The core is slabbed with a diamond saw blade. Cores are slabbed using water as the coolant-lubricant, or with a special dry-cutting sawblade. When the dry-cutting sawblade is used, a dust collection system is used to control air quality within the saw room.

6.3.2 Rubble from core not being slabbed is bagged in polyethylene lay-flat tubing and sealed with a heat sealer, but not split into archival and research portions. Each bag must be marked with orientation marks and depth indicators and placed in its respective box, row, and position.

6.3.3 Rubble from a core that is being slabbed is removed from the field transport bag and laid out on the work table. An approximate 1/3 - 2/3 diameter longitudinal split is made on the rubble sample. Each split must be rebagged separately in polyethylene lay-flat tubing and heat sealed, with a minimal amount of disturbance to the sample.

6.4 Final Slabbed Core Marking

6.4.1 After slabbing, the research split of core must be removed from the saw jig first, the archival split afterwards. Both splits of core are laid out in the Core Processing Area, with the 1/3 and 2/3 splits placed face down, parallel to each other, and oriented correctly. Any markings that may have been obscured during slabbing shall be verified using the sample information section of the Core Processing Checklist (Attachment A) before being redrawn. The core is then be placed in its respective box, row and position.

6.5 Core Photography

6.5.1 The core, whether newly slabbed (3" diameter or larger) or whole, shall be photographed to record its initial condition, position in the box, orientation, and color. The Core Photography Log (Attachment C), is used to document photography of the core, and includes borehole ID, photographer's name, film speed and f-stop, and date. Information on each exposure must include the following: exposure number, research (RCT) or archive (ACT) bar code number, box interval, and remarks. The SMF Geotechnician completes this log as the photographs are taken and initials and dates the action. The Log is signed and dated by Curatorial staff after its completion to signify verification of the Log.

6.5.2 The core and labeling cards must be arranged as shown in Attachment D. Ensure all core markings, information blocks, and significant features are visible and in focus. If authorized by the Curator, moisten the core with a distilled water spray to enhance the contrast of the core's color and textures.

After each exposure recheck the focus and core placement to ensure correct alignment and legibility. Upon completion of the exposure the SMF Geotechnician will replace the box lid, and remove the box from the photo stand. A minimum of two set of prints shall be maintained, one by the SMF and one by the Records Processing Facility (RPF).

6.6 Bagging of Core

6.6.1 If bagging of the processed core is deemed necessary by the Curator, it must be sealed in polyethylene lay-flat tubing as soon as it has been marked and labeled. Lengths of lay-flat tubing are cut for each core interval. One end of each length is sealed with a heat sealer. One side of the tubing is marked with the top and bottom depths of the core interval near the ends. Orientation marks, red on the right and blue on the left (Attachment E), are drawn on the plastic bag. The approximately 3 foot section of core is laid on a contoured polystyrene cradle. The core and polystyrene cradle are then inserted into the premarked lay-flat tubing, the excess air are squeezed out, and the end of the tubing heat sealed. The sealed section of core is placed in a protective cardboard divider pad and positioned in the box. This process must be repeated for the other row in the box.

6.6.2 Upon the completion of Core Processing, containers must be sealed with filament tape and prepared for storage.

6.7 Cuttings Processing

6.7.1 Following confirmation of samples at the SMF (LANL-ER-SOP-12.02), cuttings are divided into archival and research splits, packaged, and stored. A Cuttings Processing Checklist (Attachment F) is used to document the various steps in processing the cuttings samples. The Checklist contains the borehole ID, container ID and interval, sample ID and interval of each bag, and a checklist delineating each stage of processing (i.e., split, labeled).

6.7.2 At the discretion of the Curator an archival split can be taken from each cuttings sample received at the SMF. Cuttings are split using a riffle-type sample splitter. The amount of sample taken for the archival split shall be up to 50 percent of the entire cuttings sample, not to exceed 50 grams. The archival cuttings sample is then placed into a pre-labeled plastic vial with screw caps. Each vial will have a label affixed denoting borehole ID, sample interval, and ACT bar code number of that sample. The plastic vial will be kept in a storage box containing other archival cuttings samples within the storage box sample range.

6.7.3 The research cuttings sample split, which will not exceed 200 grams, are kept in plastic vials with screw caps. Each vial will have a label affixed denoting borehole ID, sample interval, and RCT bar code number of that sample. Investigators requiring amounts of cuttings greater than 200 grams shall collect them at the borehole site and then submit a Sample Collection Report (LANL-ER-SOP-12.03) to the SMF.

6.7.4 Vials containing the research and archival splits of cuttings are stored in separate boxes. The borehole ID, container interval, RCT or ACT bar code number (if applicable), and missing footage within that container (if applicable) are entered into MacCSITS. Four permanent label types are generated using information contained in MacCSITS with the aforementioned information contained on them. Boxes are sealed with filament tape.

6.8 Sample Storage

6.8.1 A Borehole Sample Container Storage Location Log (Attachment G) is generated using the information in MacCSITS and includes the container ID, borehole ID, box number, container depth interval, sample type, the storage location, the name of the person storing the container, and the date the container was shelved. The storage areas shall be access-limited.

6.8.2 The 1/3 and 2/3 diameter splits of the processed core, as well as non-slabbed core, are shelved separately by acquisition site and location ID system in the sample storage area (Room 110, Building 271).

6.8.3 Both the archival and research cuttings sample splits are stored in the sample storage area in Room 110, Building 271.

6.9 Radiologically Contaminated Sample Handling and Storage

6.9.1 All radiologically contaminated core is stored and handled in a designated area that is segregated from other core storage and handling areas. This designated area is posted as a "Controlled Area", "Radioactive Material Management Area". Non-contaminated core will not be allowed in this area. This area is separated by fencing from other storage areas and is maintained under strict chain of custody protocols (locked at all times when not in use).

6.9.2 Radiologically contaminated core is received and transferred through a single designated entrance located next to the Controlled Area. This entrance is used exclusively for radiologically contaminated core and all other non-contaminated core is not allowed through this entrance.

6.9.3 Core that is below the Action Levels listed below may be handled, processed, and examined with the following precautions: (1) Personnel dosimetry (as appropriate) and Radiological Worker II training shall be required for work in this area. (2) Laboratory coats, shoe covers, and plastic or rubber gloves must be worn. Gloves should be secured at the wrist as necessary. (3) Eye and face protection must be worn, as appropriate, as specified in AR 12-1, "Personal Protective Equipment." (4) Workers should periodically monitor their hands during work. (5) Upon completion of work or prior to leaving the area, workers shall monitor those areas of their bodies that are potentially contaminated. At a minimum, this includes hands, arms, and front portions of the body. Workers should perform a whole body frisk. (6) Eating, chewing or drinking will be prohibited in the Controlled Area.

(7) Handling, processing and examination of sample materials will be kept to a minimum.

Action Levels

Beta/gamma	5,000 cpm/probe area
Alpha	250 cpm
Tritium	50,000 pCi/ml

6.9.4 Handling, processing, and examination of core that is above the Action Levels requires approval from the Curator and a special Radiological Work Permit (RWP). The RWP is issued and approved by Group ESH-1. The RWP designates type of personal protective clothing and other precautions as necessary. It may be necessary to limit manipulation of this core to storage only and will be decided on a case by case basis.

6.9.4 When radiologically contaminated core is handled, the radiological contaminated core storage (Controlled Area) cage is surveyed by ESH-1 on a weekly frequency (minimum). The entire storage area is surveyed on a monthly frequency. Surveys will include alpha and beta/gamma removable contamination and dose rates. A special air test is run on a weekly frequency.

6.9.5 All core boxes must be marked in accordance with Section 412, Radioactive Material Labeling of the Los Alamos National Laboratory (the Laboratory) Radiological Control Manual.

7.0 REFERENCES

ES&H Administrative Requirements (AR) Manual, AR 12-1, "Personal Protective Equipment"

LANL-ER-SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials

LANL-ER-SOP-12.02, Transportation, Receipt, and Admittance of Borehole Samples for the Sample Management Facility

LANL-ER-SOP-12.03, Acceptance of Non-Borehole Samples by the Sample Management Facility

"Branch Technical Procedure: Transport, Receipt, Admittance, and Processing of Borehole Samples for the SMF," 1989, Yucca Mountain Project Office, Las Vegas, NV

ER Project Sample Management Facility Contaminant Criteria for the Acceptance of Samples, February 8, 1994

Los Alamos National Laboratory, Radiological Control Manual, 1994

8.0 RECORDS

The SMF Administrative Secretary is ultimately responsible for the transfer of these records to the ER RPF in accordance with the procedure for the Laboratory ER Records Management (LANL-ER-AP-02.1)

9.0 ATTACHMENTS

Attachment A — Core Processing Checklist
Attachment B — Core Markings
Attachment C — Core Photography Log
Attachment D — Photography Set Up
Attachment E — Marks on Lay-Flat Tubing
Attachment F — Cuttings Processing Checklist
Attachment G — Borehole Sample Container Storage Location Log

SAMPLE MANAGEMENT FACILITY Core Processing Checklist

	Research	Archive	Box ID Number 1 of Borehole Top Bottom					
			00501					
3. Missing/Removed Blocks in Place?	_____	_____	Sample ID	Top	Bottom	Status	Packaging	Comment
4. Permanent Box Labels applied?	_____	_____	000387	0.0	4.0	REC	None	
	_____	_____	000388	4.0	4.2	REC	WC-Fld	Unknown
	_____	_____	000389		4.2	6.0	REC	None
5. Depth intervals recorded at top and bottom of each box row?	_____	_____						
6. Orientation marks easily visible?	_____	_____						
7. Depth markers clear and legible?	_____	_____						
8. Box dividers inserted?	_____	_____						
9. Core in foam cradles?	_____	_____						
10. Boxes photographed?	_____	_____						
11. Box lids closed?	_____	_____						
12. Permanent assigned shelf location:								

SLABBED CORE ONLY

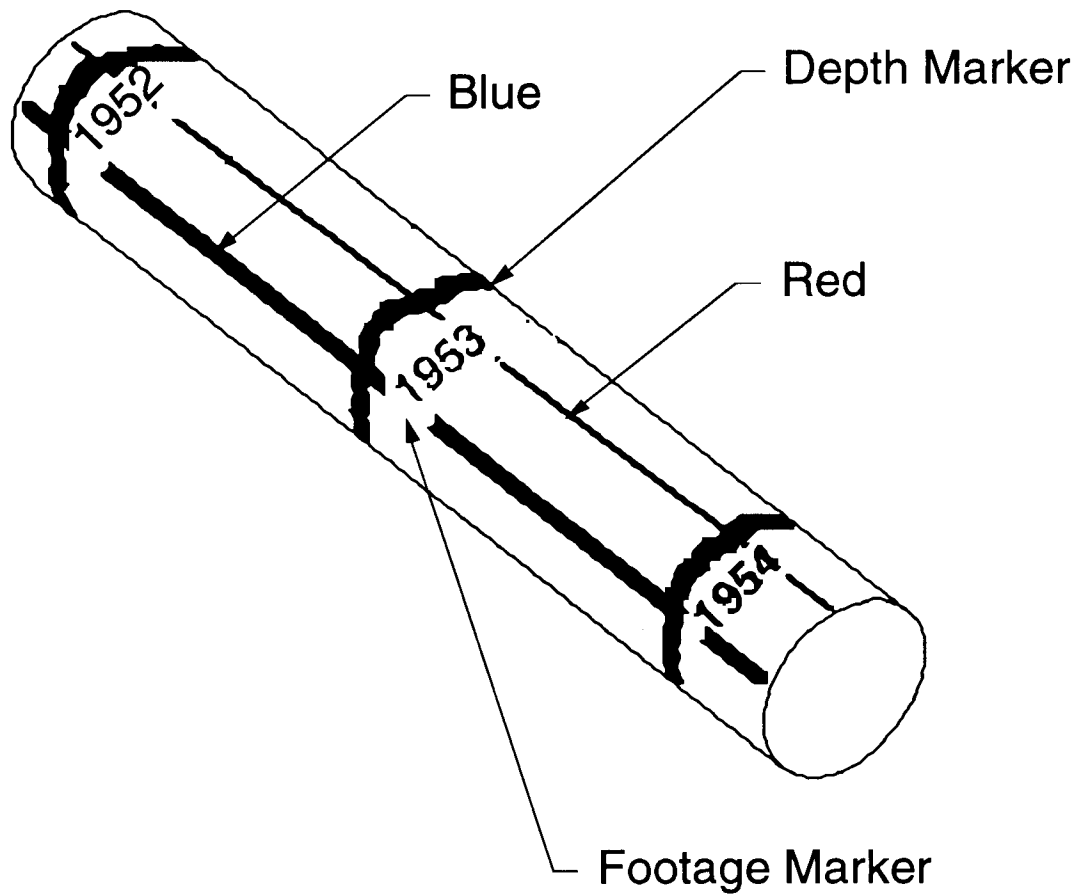
Special Instructions: _____

- 13. Duplicate boxes constructed? _____
- 14. Orientation marks duplicated? _____
- 15. Core slabbled? _____

Geotechnician _____ Date _____

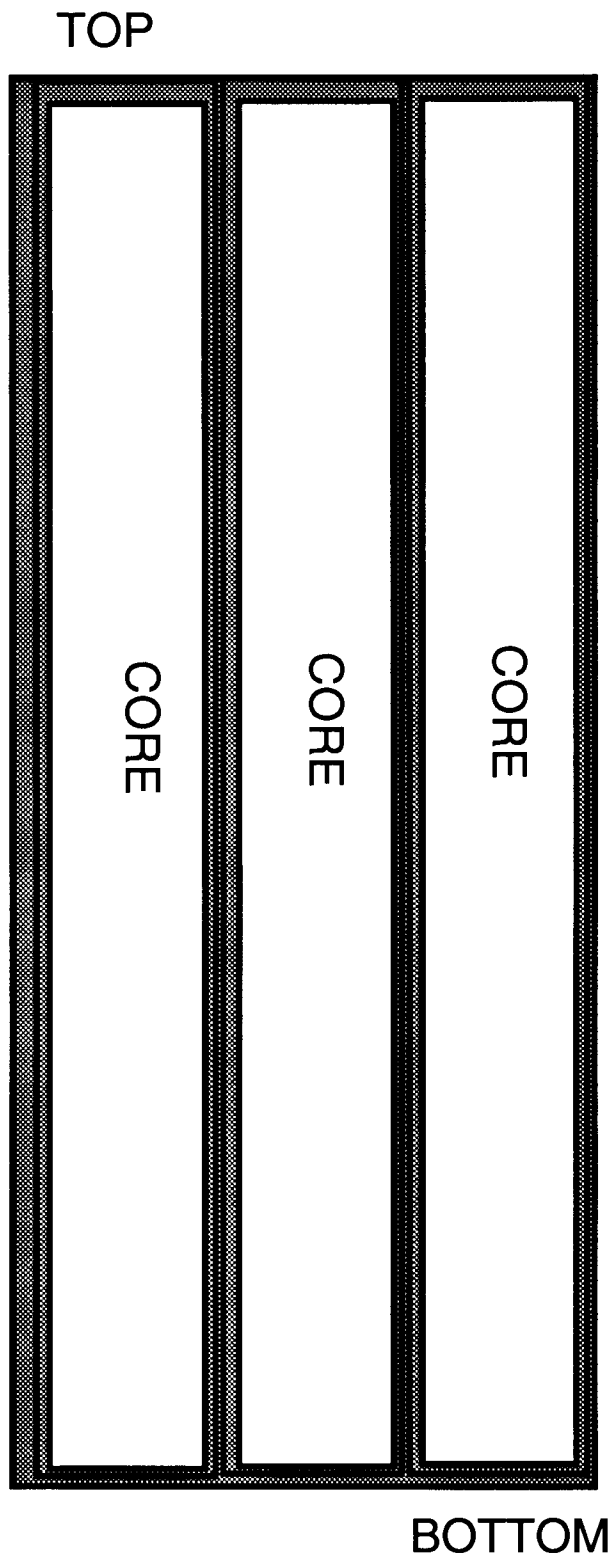
Curatorial Staff _____ Date _____

Orientation Stripes



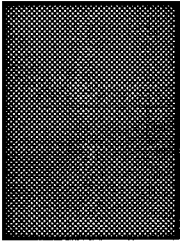
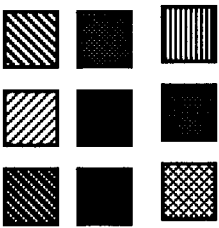
CORE MARKINGS

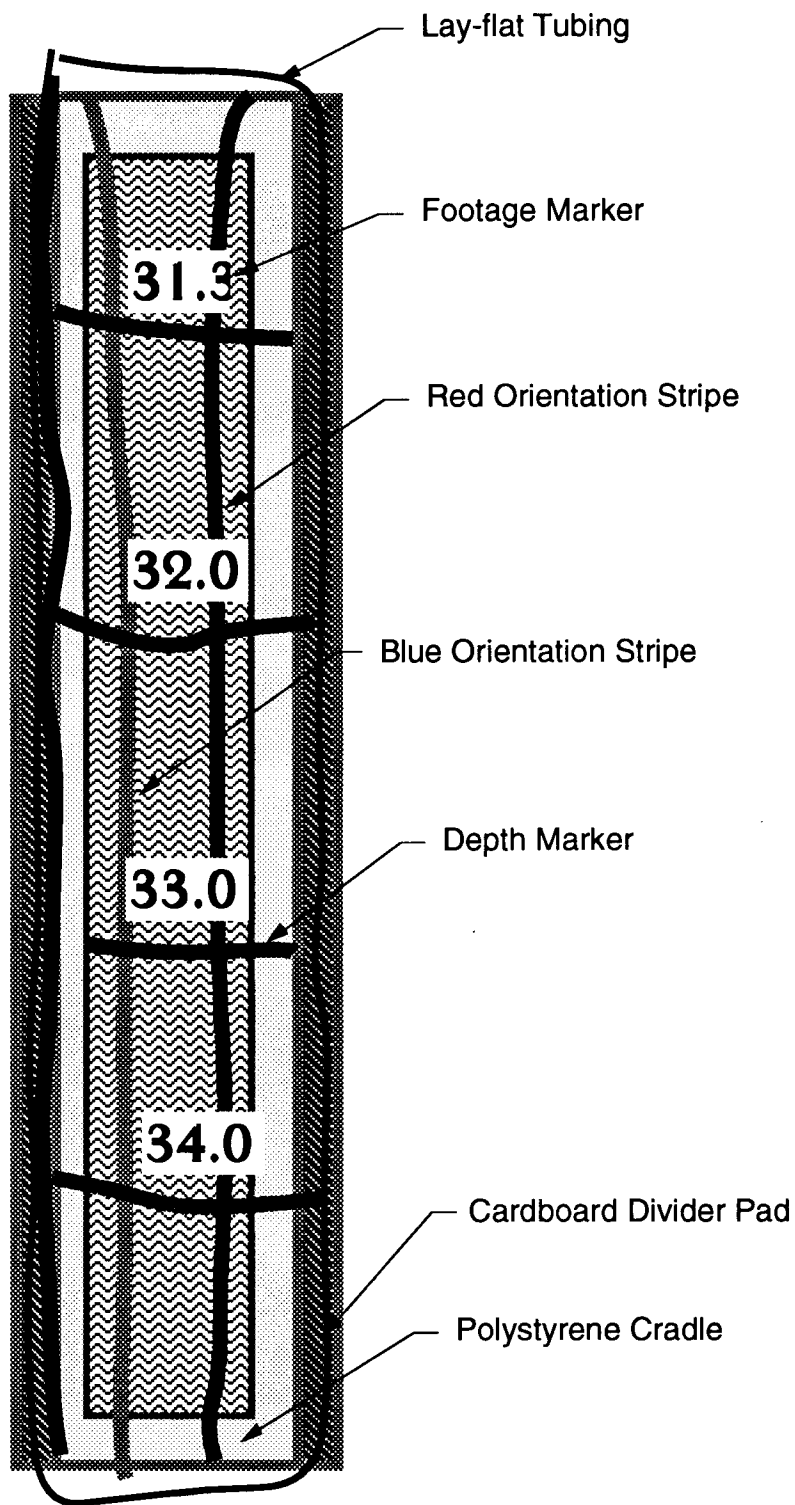
Prepared By _____ Date _____ Checked By _____ Date _____



Core Photographic Set-Up

LANL-ER-SOP-12.04, R1

 Gray Scale	Borehole ID _____ RCT/ACT Bar Code # _____ Depth _____ To _____ Date Photographed _____	 Color Scale
---	--	--



Marks on Lay-Flat Tubing

LANL-ER-SOP-12.04, R1

SAMPLE MANAGEMENT FACILITY
Cuttings Processing Checklist

Special Instructions:	Box ID	Number	Of	Borehole	Top	Bottom
	00900	1	56	Example	0.0	6.0

Sample ID	Top	Bottom	Status
001953	0.0	4.0	REC
001955	4.0	4.2	WC-Fld
001979	4.2	6.0	REC

2. Samples Spit? _____

Research Archive

3. Duplicate Box constructed?	_____	_____
4. Box Labels applied?	_____	_____
5. 2 Sample Vials Labeled?	_____	_____
6. Samples Placed in box?	_____	_____
7. Box lids closed?	_____	_____
8. Perm. Shelf locations assigned?	_____	_____

Geotechnician _____ Date _____ Curatorial Staff _____ Date _____

BOREHOLE SAMPLE CONTAINER STORAGE LOCATION LOG

Wed, March 4, 1995

Number of records listed: 4

MacCSITS v.3

BoxID	Of Borehole	Number	TopD	BottomD	Type	Research Loc.	Archive Loc.	Date Stored	By
001595	122\LA MESA	1	0.0	5.8	Core	_____	_____	_____	_____
001596	122\LA MESA	2	5.8	12.5	Core	_____	_____	_____	_____
001597	122\LA MESA	3	12.5	18.7	Core	_____	_____	_____	_____
001597	122\LA MESA	4	18.7	25.0	Core	_____	_____	_____	_____